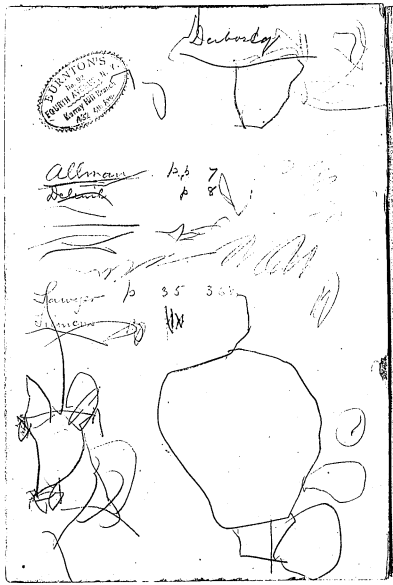
Francis R. Upton Notebook

This is the first of two notebooks used by Upton in November and December 1878 to conduct a literature search for the Edison Electric Light Company. Upton searched through patents and journal articles for information about arc and incandescent lamps. Many of the entries in the first part of the book pertain to patents for lamp regulators. On page 53 is a note by Upton about the uniqueness of Edison's lamp design. Near the end of the book are a few notes from patents and journal articles concerning the platinum group of metals. The first page bears the inscription "Mch 1905 This was my first work for Mr. Edison. FRU." The back cover is labeled "S" and "Heating substances." The book was used in both directions. The pages in the front of the book are numbered 1-75. The pages in the back of the book are numbered 1-15; there are also 5 unnumbered pages of notes.

Blank pages not filmed: 29, 34, 45-52, 61-64, 74-75 [front]; 12-14 [back].



Francis R. Upton
115 East 14 St

$2.00 reward will be paid for return of this book if found.

Regulators 3.

Saturday Nov. 16. 1907

Mch 1905

This was my first work for Mr. Edrich.

Drew

1843 No 9745

Bain regulating current by lifting and depressing plates in the battery by means of clock work regulated by magnet acting on stop.

See K. 2

1845 King see Materials for carbon

1845 Wright 10548 M. p. 2

1846 Greener & Staite " " "

11.076 Page 5 M

1840 No 864 H. Dumping plates in the Pinkus nothing grooved and running! Coming mills do with US Co Friends.

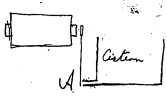
1846 No. 11.449

Staite's

1843 No 9745 England

Benn Alexander Nov. 27 1843

Wheel connected with clock work which turns the plates in the liquid



containing the fluids for the battery

A stop which is closed when the current is too strong.

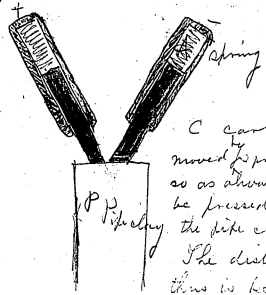
A Clock work arrangement is suggested by wh. the plates shall be turned at a regular rate

---

J Curtis No 11,442

1846

2



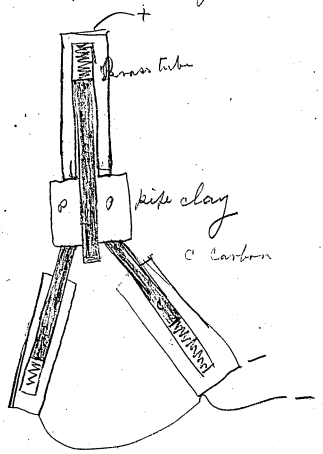
C carbon pencil moved by spring so as always to be pressed against the pipe clay. The distance thus is kept constant.

Fontaine p. 17

1846. State 11449

3

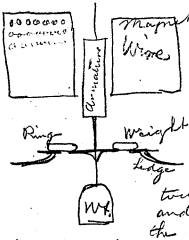
Modification of the above



1847 Staite 11.783

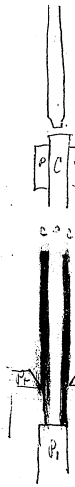
Centrifugal regulators
Wts thrown out and friction stops speed

1847
Staite 11.783



It depends lower.

Staite 1846 11.449 4



on Carbon held in pipe clay

C Carbon
p pipe clay
Pt Platinum

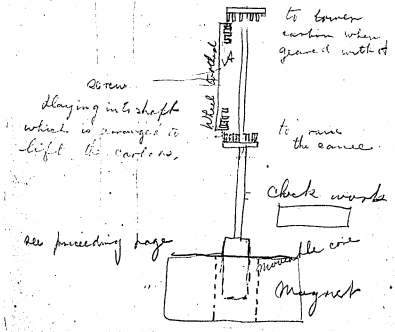
Running against the Pt points the pencils pieces into tube P_1

1847 11584

Bain regulating current by supply of liquid in battery preventing air from escaping and thus fluid entering battery.

1847 No 11783 Slate

Carbons



Idea to telegraph by means of blocks through various colored glasses

The first

1847 July 8. to use clock work and magnets.

Slate No. 11,783. see History 1848 p. 161

Williams Edwards

To revolve and raise known carbon by clock work.

Centrifugal regulator from spindle with magnet

Patented France by Petrie.

13-271

1847

Slate 11783

Flashing light by withdrawing and advancing from electricity by means of clock work.

The wheel is connected with a Apparatus for raising and lowering Holes.

France "Patent" 13-271

Taken out by Mm Gaigneau on Jan. 14, 1848. Refused

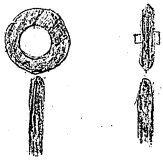
to Comptes Rendus Vol 28. - 157

Staite ~~1847~~ 1848

No. 12,212

A clock work vibrator which moves the lower carbon to suit the current. The regulation coming from a moveable iron core of a magnet.

Disk rotating for upper electrode



1848 Staite Iridium used SA 1

1848 12.276

Allman p. 55

The change of contact of bar b with m heats m and thus whole rod expanding it. This expansion is utilized for changing m metal Contacts.

Patented France 15-171

In Allman's French spec. he claims no general patent only the two way chronon.

See p. 55

1848 No 12276 7

Allman

	m.m	Vol	50	300
	Antiqua		35	305
			7	207
			16	255

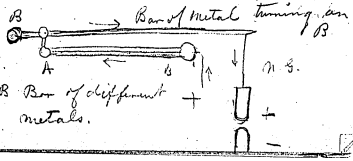
By the deflection of the permanent magnet by a conductor. N.S.

Repulsion of two magnets.

Decomposing effects. N.S.

Heating effect need to govern distance between the poles. No 1

2 Two bars with the [illegible] expansion unequally and to separate the poles



1848 12.295

Hjorth Governor for magnetic machine

July 30

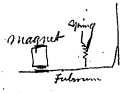
1849 Deleuil French 16 - 4574

Guillet.

To regulate the ~~electric~~ distance between poles by magnet acting on lever lifting ~~the~~ one of poles. Drawing so small could not trace exactly lines. Read again Sec 2 and could not understand

Polytechnische Central Blatt 1855 p 1131 an account with drawing telling mode of action.

Upper carbon held and moveable by hand



a catch acting into a detent to so arranged as to lift lower carbon when current is too weak.

See R. p. 67

1849 No. 12.482 8

Pearce

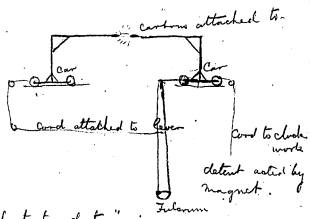
Disc and pencil each ~~[illegible]~~ by the operator

Clock work

Platinum springs to hold Carbon with Iridium tips

Carbon giving to hold the other two from touching and giving a chance for the ~~[illegible]~~ arc

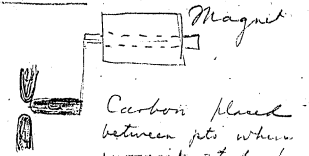
1849 Foucault - an account in Gavarret Traité d'Electricité Vol. 2 p. 511 1859
Thought to be the best from the famous



"The best to date"

1849 12.482 9

Pearce



Regulating direction of light for Lt House.

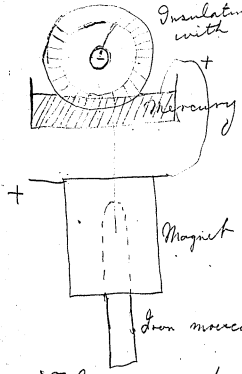
Repertory of A. & 14 193.
M Sci 51 189

See page 6 ~~0~~ ~~44~~ G 65

1849 12,772 18

Stritt and Petrie

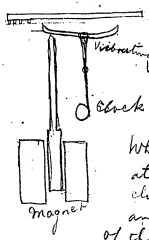
Increased current increases resis.



The movement of core turns wheel and brings more or less of Pt in circuit

1849 Staite & Petrie 12.772

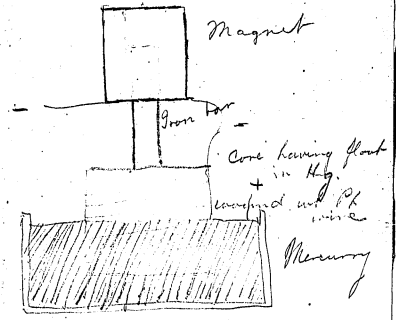
A counterpoise chain suggested which as carbon burns shall pull on support thus equalizing



When the poles tires at their wished for point clock work locked by an arm from the core of the magnet.

1849 12.772 11

Staite & Petrie



The change of current raises and depresses float bringing Pt wire in circuit more or less.

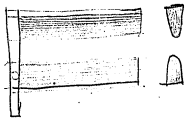
Pt. wire contact can be used instead of Hg.

1849 12.899 Pulvermacher

Regulating currents by means of adding resistances. The n ___ put in circuit through magnets. The drawings very blind.

Regulating by means of battery

Gillespie in Mech. Mag Vol 50 p.435 suggests exactly the form of the Wallace lamp and also that it could be made circular.



Staite and Petrie.

An arrangement of spiral springs serving to prevent the great pressure of the carbons.

M. MN. 52
12/p 240 246 261

Artizan. 8 p. 65

1850 13.302

Shepard

In vacuo

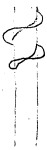
Carbon

1852 13.933

Pulvermacher

Nothing

Allan's spiral electrode
Mech. Mag 47 p. 390

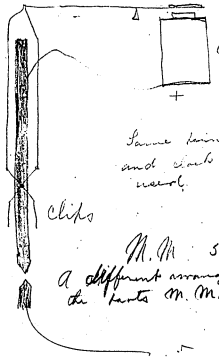


Two spirals placed at right angles to each other and made to revolve bringing fresh pts. from the core to play between.
Like?

1852 14. 198 13

Robert.

An arrangement by wh. a magnet can act through mechanism to hold and raise the upper carbon when current passes through it.



Same principle varied and such work also used.

M.M. 58, 41, 56

A different arrangement of the parts M.M. 17 p 206 1867

1852 212
Could find nothing bearing on
expansion regulating

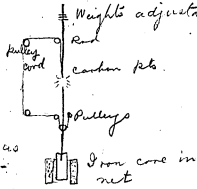
Dr. Watson's lamp Dingler Vol 130
p. 345 1853 full account with
illustration. The lower carbon is
moved by spring playing into a
wheel from a second magnet.
Year Book of Facts 1854
Mr. Watson claimed that the dye stuffs
manufactured in his battery paid
for the cost of running the lamp

1852 14,330
Jackson
clock work
sulphuric acid resistance
foolish

1852 212
Cater and Watson
Mechanism for adjusting upper carbon
by grip from a magnet.
Rheostats used for changing lamp
~~frame~~ 1852 24-35/5

1852 No 561 signals for R. R.
1852 613 R. R. refused.
~~1852~~ 595 counter connection
1853 No 119
Binks various fanciful contrivances without drawings.

1853 700 Smelting metal by light.
1853 881 Gaumon Elec. Mag. Mac.
Hugl



Germany

1854 Jasper of Lüttich mechanic

p. 299

Polytechnisches Central Blatt 1854

from de Technologiste Jan 1854 p. 187.

In Poggen Vol. 139 - p. 495 1870

a lamp almost identical to this

is described.

State 1853 634

Carbon raised by float and regulated by friction clutch held by magnet (1888 W

1853 English 1806

Fontaineswoman

Complicated apparatus for regulating magnets and springs

1853 English 2457

Verdun Globes representing earth.

1854 English 83

Watson Signalling

1854 English 2555

Varley "may be used for light".

1854 1088

Reing Spring iron in Hg.

1855 England 739

Chapman — Quite ingenious many variations on the same idea in this patent

Upper carbon braked when current flows and lower carbon withdrawn giving arc. Current stopping allows the two to come together 1855 France 48 – 120

1855 England 998

Escape of gas from decomposing H_2O regulated by Electro magnet. When shut the gas forces H_2O out of reservoir and thus cuts off the supply

1854 France 42 – 29 — In 1854 poles are found in it

Lacassagne et Thiers

1855 1646

Deichamps 4

Lantern work for ^ under H_2O

1855 2613

Pule — Escaping gases from battery

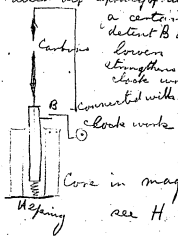
France 1855 50 - 22 - 13931

Upper electrode held in ways by magnet

Russia 1856 Bulletin d Societé d'Encouragement 1862 p. 270

System of Prof. Stakowski.

When current weaken lower pole is raised by spring & on reaching a certain height releases detent B of clock work wh. lowers upper pole. Current strengthens lower pole falls clock work is locked by detent holding upper pole.



see H. p. 71

1856 England 2456

Lacassagne Thier

Lower electrode floating in Hg supply of Hg regulated by magnet Fontaine p. 22

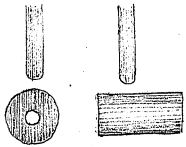
1856 2547

Way Mercury used falling Fontaine p. 32.

1857 573 Holmes Magneto for light

1857 England 588

Harrison France 1857 .65 - 257



Cylinders of C

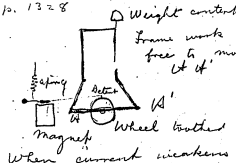
Clock work for moving the cylinders and regulating distance.

1858 Dubosq and Marcais. The flow of oil regulated by a magnet.
— Dingler 148-194

Harrison

Hg regulated with Magnet

Germany
1860 Stühler. Karsten's Ency Lopedia Vol XX p. 1328



When current weakens the magnet allows the detent to spring up and carbons are brought together by the weight.

1857 10 33 Two umbilicus equi. 18
Pascal. P. Sp. one through the bowels
passing through a relay, wh. the current
weakening opens a auxiliary circuit. The
2 current decomposes water, the pressure
from the gases brings carbons together
Dingler 156-278 1861

N. Sa 32.457

1857 12 5 8 1857 61-326
Fontaine (2)-310
Way Mercury apparatus 279
Scient Amer VIII 4 #

1857 14 12
Harrison materials used for
carbons
electrodes and plants used
to regulate carbons Poly. Jour 15 2-201

1857 28 41
Ways
Hg apparatus
Fontaine 32.
~~1857~~ Shepard 29 8 7 Magnetic.
1857 31 6 4
" ~~Dan~~ Burleigh & Z
"Carbon coated with silicous
glaze"

1856 France Serrin 71. 174

oscillating regulator Fontaine or Guillemin very fine lamps

1858 England Clark for Serrin.

1859 France 75-52

Gramet. The upper carbon constantly touching the lower through a wheel and the regulation regulated by an movable arm on the magnet

1860 France 79-37 Lamtin H p. 76

System lower carbon overnighted being attached by cord to upper. If current is too weak the regulator is freed by a detent lower and upper approach until current flows then locked.

Bulletin de Society d'Encouragement

1860 ≡

1858 Shepard 2368

carbon held by bridge pieces

1858 Hunt 2532 Batteries and carbons

1860 1626 P. S. Reflectors

2546 P. S. Frictional sparks

1862 1516

Morris.

Vacuum tubes

Heating effects through Pt.

for purchase

1863 ~~Heating~~ ~~Hanging~~ cloth under light,

1864 1792 M. B.

Eddy Exting wishing lamps

1867 261

Siemens

for lighting buoys &c

Pt wire can be used.

He uses the static discharge ~~through vacuum tube~~ of a cable and magnet. The magnet breaking its own circuit.

1867 221 P. S.

Electro Magnetic for light

1861 France 81 Thier Slaughter

1861 France 81 Poisson and Stardley
gas burned

1861 France 81 Gramme

Wheel braked wh. connected with
coupler in electrodes. Quite complicated.
worked only one way.

1863 France 86 Meynard.
to regulate pressure by Elec.

1863 France 86 Lontin et Digney
Wheel braked only the same position
Kal as Gramme, the carbon branch
[illegible] other

1863 - 67 France 86 Foucault
Regulator Guillemin very
Fontaine fine pictures application
page 675

See Page 25

Vol 81 missing

1867 2307

Holmes improvement in Mag. Elec.
Mac

1869 391 A J Magneto

1869 regulating gas jet in lamps

1870 1917 D. S. Dinsling current so that some battery shall do 2 times as much work!

1872 3092 Ng Plantiny for ships

1873 No connection a Thermo-pile new battery
3194 - 3540 - 3943 - 4144.

1874 265 Magneto-Electric Machine

1874 2717 Compass cards

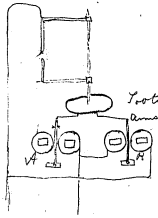
1874 3509 Fonseful. Batteries

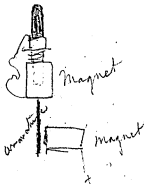
1873 618
Wilde

Carbon regulated by means of weight and left hand screws. France 1873.7.

a fuel wh. may be used under boilers

1873 France Siemens & Halske N.P 7

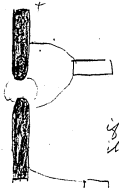




1873 2006

Siemens

Two magnets used



with fine wire
Magnet in shunt
btw two poles, connected
by ~~stock~~ work so that
if poles are too far apart
it will bring them near

Magnet in circuit large
wire connected with
~~stock~~ work so that if the
poles are too near and
current too strong it will
separate them.

1874 1261 U.S. Feb. 1874 p. 774
under Day.

Lake ingenious contrivance
to keep the carbons near each
other by means of magnets.
The contact is made and broken
carbon withdrawn by core magnet.
1874 Improvement Oct. 20 ~~1874~~

1874 1446

Johnson. Nothing practical.
electrophorus &c.

1874 1820 Whitehouse.
Rods of C 90° rebowing
no burning

1874 4435
Powell arrangement for putting
C in air tight globe

[illegible] 4167 P. S. keep tight
metal C
3466 Mercury jet and
battery

1876 3315
Johnson
Arrangement for moving both
carbons and extinguishing
and lighting.

1876 Sept 11 No. 3552

Paul Jablochkoff Paris

To light a small strip of C is placed between poles.

"Void by reason of the patentee having neglected to file a specification in pursuance of conditions of the letters patent"

1876 Nov U.S.Ct 184.553 Clark unstably.

1876 4312

Placing light on a hinge

1876 Weidermann 4805

See page 30

1876 Varley 4905

Electro Magnet Machines ~~for high~~ potential

1877 Eng 494
Jablochkoff
complete patent for candle

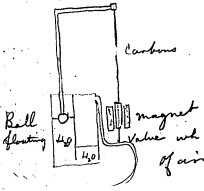
1877 Eng. 1996 Jablochkoff.
Heating rod of carbine by means of secondary current.
~~See~~ See heating Subject carbon

see page 31

1866 ~~France~~
Regulateur Giuffre Medaille d'argent
Bulletin de la Société d'Encouragement
Feb 1866

1867 Feb. – 13 – de S. d'E. –
Medaille d'or for improvements

Mr. Highley proposed and made a regulator by wh. the carbons were regulated by the escape of air from a reservoir. The valve opened and shut by magnet — called the Malakon's Pneumatic Regulator Prof. Science Review 4 - 138



1871

1871. France Chutaux Nouvelle année.
Tome 1 No. drawing.
Pulley worked by magnet

1872

France. Chateaux Nouvelle Serie. 4.
No dimming. Magnet acting on rotatet.

1872 Lodyguine. N. 1 4
Heating bodies by resistance!

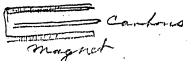
1872 U. S. A. 123, 923 Jan
feel motion with clock wards -
"retrograde lines or motion".

Day USA.?

1874 France 11
Lauchenet and William
Brattery

1874 England Apr. 24. 1438
Werdermann Werdermann
Using the electric arc with
a blow pipe for mining. The
arc could be deflected against
the rock by means of a magnet.
The rock is thus disintegrated.
The carbons were brought
into the field parallel to each other
how they were separated not mentioned

k pipe for air
g g carbons



1876 see pages 22-23

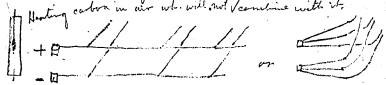
Comptes Rendus t 82 p 280

Electric light regulator. Main current works relay which by auxiliary current works apparatus for moving or lowering the carbons

Dingler 220 - 281

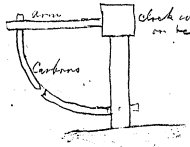
1876 Aug 29 Woodward. 181.613 30 1876

Illuminates but does not claim as new mode of dividing current



England Dec. 12 No. 4805 1876

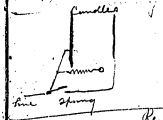
Werdermann. Carbons in a curved form



Carbons fixed side by side and insulated with mica or placed in cylinders hollow or not insulated. He also uses a coating of boracic acid to protect the carbons from the air. He claims a coating of metallic oxides

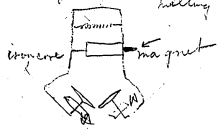
1877 ~~Donnegrouse~~ English 1877 - 3170 31

Kindler for the electric light used with Jablochkoff candles. A spring pressing against the candles, wh. when burnt to the spring allow connection to be made to the next candle.



1877 ~~Reggier~~ U. S. A. May 19. 177

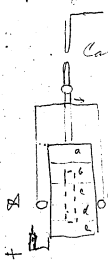
Carbon made of disk, carbon, sugar, iron filings. Iron core pulled in rolling disks apart



(A) Clock works

English 1877 . 2934.

Clerk Regnier arrangement by which the core of a magnet is always in field



abcde coils with connections arranged so that the current will flow through only part any d c b

1877 Clark for Regnier 2952

Disks for Electrodes in various positions. Carbon Sugar Tobacco

1877 English 1910 May
Heinke P.S. Two discs.

1877 English 2944
Clark for London see p 0.5

1877 N.S.d 195.436 Dec
Wallace
Two edges of carbon brought
near each other

See
Greenwood & Smith

1877 Sawyer 194,500

Claims 1 The method of obtaining an electric light, consisting in heating a refractory substance by bringing it into contact with a heated conductor of electricity.

2. An electric candle in which a ~~con~~ ~~cond~~ conductor of electricity, heated to any desired degree of intensity renders luminous a non conducting substance in contact therewith, as set forth.

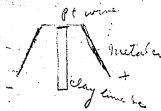
3. An electric candle, in which the circuit producing the light is en-

---

Lemons Lec. p. 21

1877 Sawyer 194,500 Aug

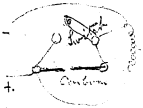
Improvement in Electric Candles



The metal is heated in contact with the clay and strong heat clay.

Sawyer 194,111 Aug

Method of using current with lamps



Resistance fixed or variable for regulating with. Switch the wiring is more

1877 aug 21 No 194,500 Sawyer

tinly metallic, in combination with a substance which is rendered luminous by heating."

4 An electric candle, in which the light is produced by the direct action of the electric current upon its conductor, in combination with clay, lime, or other refractory substance substantially as shown and described.

5. An electric candle, the combination, with a refractory substance rendered luminous by heat, of apparatus for forcing the same to a constant bearing against a heated conductor, substantially as shown and described

1878 205,144 June 36

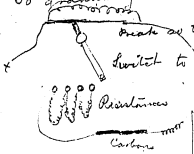
Sawyer & Man

A globe which is filled with N. every part of which is hermetically sealed. It belongs to the electric lamp.

If the rod breaks the carbon will be quickly forced to new connection"

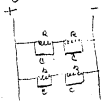
1878 N.S.a 203,303 June 25 '37

To gradually turn the current on or off



Retarding devices for switch as fan or compressing air.

Arrangement



R - Resistance
C carbon

See Woodman p. 30

1878 Sawyer 205,303 June

a safety switch is placed in circuit, and a fusible wire is engineered.

fuse A is fused when the current is too strong

"Change the circuit" = add or take away resistances, add or take away electromotive force.
Stirate and Petrie 1849 p 10

Sawyer USA. 205,303 June

He claims "In an electric lighting system, an electrical automatic energized by the current flowing in such system, which, when there is an abnormal flow of current in a part or parts of such system, automatically operates to disrupt, disconnect or change the circuit of such part or parts."

This would cover nearly all regulators known especially

Stirate and Petrie 1849 p. 10
1852 p 14
L Jackson 1855 p 16
Lacassagne et Thiers 1859 p 15
Dashiel
Any regulator for adjusting resistance

"Energized by the current" = in any way affected by the current, magnetical electrolytical, heating or lighting effect utilized.
"Abnormal flow" = Any amount of electricity wh does not fulfill this condition. With the smallest quantity of Electricity to produce the greatest light.

1877 aug 21 9 [illegible]

1878 Lawrence M.S. of 205, 305 June 59

An ingenious arrangement to regulate the action to the shinning engine of magnets. Complicated

1877 English 2585
Power and Moore
Patent dated Jan 5 1878

1 Use of strip of carbon
see Greener & Slade 1 Page 5

1874 Eng. 1820 Whitehouse

2 Use of carbons in circular frame work
see 1845 Wright 10,548 1.82
1848 Slade 12,212 1.86
1848 L. Mott 12,219 1.16
1849 Power 12,482 1.18

3 Application of flowing electrolyte of Hg. Two or more.

4 Moulded electrodes
see 1847 Slade 11,783 1.99

5 Short detached pieces of carbon

1874 English 2 5 85 Prosin & Morse 41
6 All in various ways construed
7 Dissed

1878 July No. 205,962

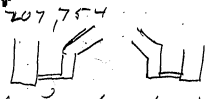
Jenkins. Carbons in segments of tips. Arc playing against separating substance

Rapieff, description in the Daily Graphic Dec. 10 with illustration said to be used in the London Times office. Could not understand the drawing

Aug Hugo Beck 3 207,753 43 1878

Tube for furnishing air to or gas to arc

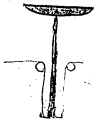
207,754



Lamp for furnishing carbon to the pts by combustion

Werdermann Regulator 1878 Oct. 4

Description in "The Nature" and Scientific American



The carbons touch and thus allow a smaller amt. of current to be used

From 1766 — 1856

The name of Stars occurs in the indices of Electrical Patents for England.

I have looked through the Indices and found no patent but those which I have read and notes of which I have taken.

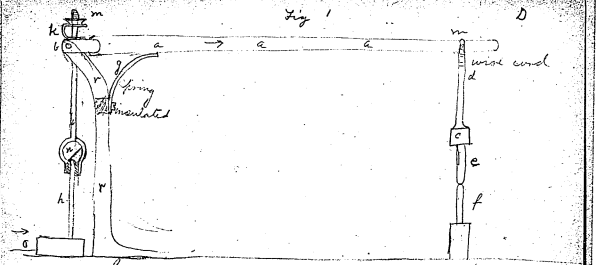
As far as I am acquainted with physical apparatus I never saw any appliance in the least like Mr. Edisons, though one has often been wished for, to produce a constant temperature with the galva-

<u>vic current</u>

I noticed this in the digest of decisions for 1877

"An applicant who devised an experimental model, which was afterwards lost without test as to its practicability, and did nothing ... thereafter until his contestant had secured a patent, cannot be said to be the prior meritorious inventor."

Stover vs. Clark 188



Sheet D fig. 1 represents a side view of another arrangement of apparatus for the production of light from electricity; a.a.a, is a lever having one end turning freely on a fixed centre b, and the other end attached to the upper electrode holder c.e.e

by a piece of wire d. The wire cord is &c. This cord d is soldered both to the lever a and the electrode holder c. Any upward motion, therefore of the lever on the pivot or centre b would lift the electrode e from the lower electrode f; but the spring g constantly presses the lever a in this direction, and would consequently is not controlled, separate the electrodes. This, however, is prevented by the compound rod or bar h, i, which is fixed to the plate b. The upper end of the bar or rod i, being screwed, receives a nut k, which is screwed down onto the spring k until it so acts against the spring g as to keep the electrodes e and f together

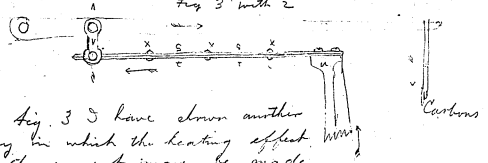
Ellinwood
Feb 8 1876

Enlarged drawing

The compound rod or bar h, i has a cork n into which the lower piece h is fitted by a screw as shown colored red. You would have observe that all the parts colored red are made of iron conducting substances. Now the current of E-C, upon entering by the ribbon i, passes up the bar h through plug n of the cork, thence to the bath to battery.

The plug of the cork n (which is on one point filed flat) being in the position shown in the drawing, that is, so placed that the flat part in in some measure presented to the conductor h, it does not afford a sufficiently conducting surface of contact between the plug and the bar h. The result is, that as this surface contact is diminished by turning the cork, the cork and bar h, and i become heated by the passage of the current, and this heating effect can, by setting the plug n of the cork, be made to suit the quantity or nature of the current employed so that a given current shall be made to produce a given heating effect, or heat the rod h, i as much as necessary. But the same current passes also from one electrode to the other as before described and when the rod, h, i becomes heated it expands and by its elongation allows the spring g to separate the electrodes e and f by lifting lever a a described. When the current is cut off h, i cools and the electrodes return by its contraction into contact.

Fig 3 with 2



"In Fig. 3 I have shown another way in which the heating effect of the current may be made to govern the position of the electrodes e and f. This is effected by means of a compound bar a, t the electric current being sent through the bracket u into the bar s, t across the link v, which couples it to the lever a, and thence on to the carbons through the electrodes f. In battery, the bar s, t being made of such a size that the current will by passing through it heat it sufficiently to cause it to curve or bend upwards, t being the bring the convex and s the concave side of the curve, owing to the unequal expansion under similar temp. of the brass bar t and the steel s which are riveted together by the rivets x x x. This curving of the bar is evident well, by lifting the lever a by means of the link v separate the electrodes as in either of these arrangements the current by thus separating the electrodes tends to destroy itself it will be evident that by turning the screws w, or proportioning the size of the bar s, t the cause and effect as to heating and separation will mutually govern each other.

5

Allman 1848 12,276 58

"In this sheet I have shewn how the calorific effect of E- may be employed in an apparatus for the production of light from E. The same effect may be produced by a variety of other arrangements, in wh. the calorific or heating effects of the current may be rendered available for separating the the electrodes, and maintaining them at a proper distance from each other. And I claim as my Invention and the exclusive property of an apparatus whereby the heating effects of E- may be employed and rendered available in and for the production of light from E-.

Nothing more becoming even remotely in the question.

1848 Allman 12,276 5

Mechanics Journal says after dis-
cription summary. 50-306

"The patentee describes next a
"modification of the foregoing ap-
"rangements, and refers to some
"illustrative figures upon a sheet
"of drawings which he has omitted
"to enrol, and in the absence of wh.
"this part of his very intelligible
"specification becomes "confusion
"worse confounded!"

London Journal says. 35—307

"The patentee remarks that by various
"other analogous arrangements, the
"calorific effect of a current may
"be rendered available for separating
"the electrodes and maintaining
"them at a proper distance from
"each other.

"He claims the use of appara-
"tus whereby the heating effect
"of E - may be employed and

1848 Allman 12.276 Eng. 60

V. rendered available for the production
" of light from E."

1877 Eng. No. 2094 Nov. 28, 65.

~~A~~ A. M. Clark of 53 Chancery Lane for London and 6 Paris France

This invention relates to improved means of controlling the mechanism for regulating or maintaining at a uniform distance apart the carbon points of an electric light.

Such regulators may be roughly classed as being so constructed that the carbon points are moved towards one another either automatically or by clockwork. A special apparatus operated by the current is sometimes applied either to arrest the mechanism by which the carbons are fed up, or to part or distance the carbons; and to effect this stoppage or separation, as the case may be, electro —

magnets are often employed, 66
which, on the passage of the
currents operate to produce the
result.

This invention consists, first,
in the employment (in lieu of electro-
magnets) of a simple wire (or
its equivalent) which by the
passage of the current becomes
heated and consequently expanded
or extended in length, this
alteration in the length of the
wire, or its equivalent, being
applied to control the action
of the various kinds of mecha-
nism used for regulating the
electric light. The wire
should be of such a
guage that by the passage
of the current it may be

heated to, say, 400° cent as a maximum. If by heating a proper length of wire a sufficient degree of extension is attained, it will be readily understood how, by connecting the wire to a lever or other organ capable of being oscillated by the tension of an opposing spring, the extension of the wire may be made either to cause the arrest of the mechanism by which the carbons are fed together, or to part or distance the carbons according to the kind of regulator employed.

It will be obvious that a strip of metal of any form may be substituted for the wire, provided it will obtain

a sufficiently high temperature and a necessary degree of expansion.

In order to understand how the extension of a wire is capable of producing the necessary movements for controlling the regulating mechanism of the carbons, suppose a silver wire 30 centimetres in length be used. Under the action of a current from a source of E— of sufficient power the wire becomes heated to a temperature of say 400° Cent, and is lengthened to the extent of say two millimetres. This wire if placed in an electric light regulator would be quite adequate to produce the movements necessary

for the proper working of the regulator, especially as in proportion as the luminous arc lengthens the intensity of the current passing through the battery decreases. Therefore when the arc has increased in length the wire may be 150° or 200° only which would cause a contraction of 10 to 14/10ths of a millimetre. Such a variation in the length of the wire is sufficient to ensure the proper working of of all electric light regulators whatever may be their arrangement, it being understood that the wire should be of such a length as will ensure the necessary

No 1 $R = 1$
" 2 $R = \frac{1}{2}$
" 3 $R = \frac{1}{3}$
in case of need
" 4 $R =$
" 5
" 6

Dr. not understand

amount of motion.
The invention thus consists
1st in the use of a wire
which is heated and dilated
or varied in length by the
passage of the current for
the purpose of regulating
electric light apparatus
generally.

Fig. 1

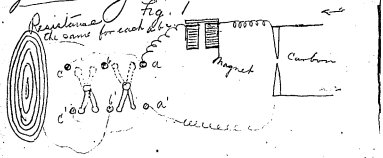
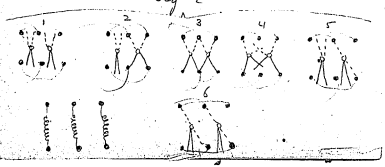


Fig 2



Claims

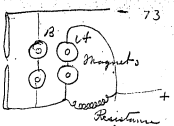
1st The use of a wire, a strip of metal or its equivalent traversed by the current and dilated or contracted according to the greater or less intensity of the current, the variations in its length thereby produced being applied to effect directly or indirectly the separation or approximation of the carbons substantially as specified

2nd The use of a metallic wire ~~of~~ or strip for feeding the carbons in combination with a resistance solenoid or electro-magnet excited by the

6 The interposition in a derivation of the current of a strip, wire or other mono-metal or multi-metal organ, wh. by its dilatation or extension under the influence of the current brings into action a commutator that electrically isolates the regulator from the rest under the circumstances referred to

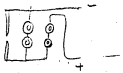
9 The interposition in a derivation of the current of a strip, wire or other mono-metallic or multi-metallic organ, which by its dilatation or extension under the influence of the current brings into action a commutator that electrically isolates the regulator from the rest under the circumstances set forth in the preceding.

1877 Clarke 2094 — 73



Substantially the same as Siemens
No. 21 1873 Tonical & England
A acts when poles are too near to
draw them together
B when too far apart to draw
them nearer

Or



A commutator may be placed
in the current.

I was compelled to read this
four times carefully before under-
standing partially as I do now.

C. Chenev
920 Washington
Washington.

Platinum

Heating solid substances

21

2585
2934
2982

Last date English
April 20 1878
French Dec 28 1874
U.S.A July 31 1878

Mech. Mag. finished
from June 1878
Lieb Ann 1860 – 1874
Popular Science Monthly 1877–78
Review 1876
Wiedemann
Poggendorf
Annales de Chimie & Physik
Philosophical Journal
Franklin Journal
Year book of Facts
Fortschritte G 1856
" 1858
Dingler
Comptes Rendus
Central Blatt
Patents English
French
Athenaeum

Chemistry
198293
(1'21-11-81-N)

1845 10.919

King see page 4 Materials for Carbons

1846 Gredner & Stark P. 5 " " " "
11.075

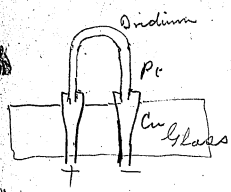
1841 De Molyns

see page 1 incandescence

1848

Stante

Iridium used and also mixture of Iridium and Pt.



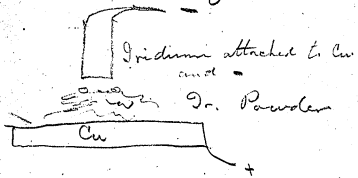
He sometimes places the wire in glass to prevent radiation of the heat.

1845 King see Page 4 Materials.

1849 12.772

Plants & Petrie see page 4 Materials

Iridium, fusing.



A plate is formed by arranging it of discharge.

1852 595 Watson and Shutter

Heating by means of fine Pt. wires

1852 14,198

Robert

Heating Graphite in vacuum.

Thin ~~[illegible]~~ strip used

1the same

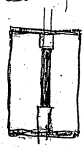
Always a candle but Electrolis increases light. Lime the same

Uses lime with the carbon

1872 3809

Konn

Carbon in N. Hermetically sealed



Conducting wire — Energy 12 Lit 9

Cu 1615
1652

Pt 9158

To seek substance infusible and of greater resistance.

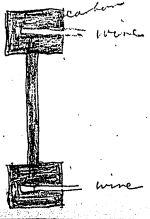
1875 No 441

Kosloff St. Petersburg

Connecting Carbon with non conducting substance.

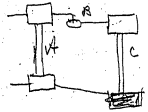
Placing wire in larger piece of carbon to prevent sparks.

U.S.A. Aug 17 1875



1875 441
Yablochkoff

Automatic arrangement so that if one carbon breaks the connection is made to another



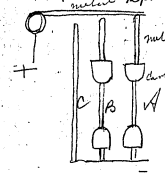
if rod A breaks the hook B makes connection with C

~~The~~ Carbon heated in vacuo or N. O of air burnt out

An arrangement of valves

1875 Sept. No 970

Jensen for Konn of St Petersburg



metal If bar A breaks connection is made with B
If B breaks connection is made with metal rod C.

1875 2410

Chauvin & Pain

Pt. spiral in globe to be used under H_2O.

The text was missing for this.

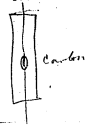
1875 4206

Lake

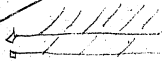
A small battery and connected with spirals which may be used for many purposes. The apparatus portable can be carried in pocket

1876 Aug. US. A 181,613 8

Woodward heating carbon in gas ink. will not combine chemically with it.



Filed Jan 4 1875



used method for connecting cardboard

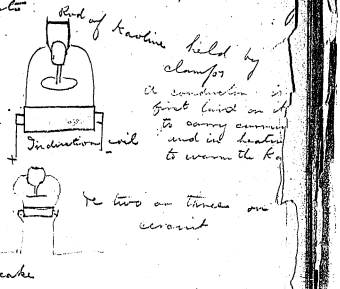
1877 U.S.A. 194,500 Aug. 21 9

Sawyer's improvement in Electric cables. A non conductor covering and heated metal conductor.

1878 Sawyer USA 205,144 June 1 26 cl

1877 Eng 1996 Jabbschkoff

Heating wire nonconductor so that it becomes a conductor for secondary currents



the conductor is first laid on the to carry current and the heating to warm the ka

the two are turned on around

Cost of Electric light by Moses G. Farmer of Salem from Scientific American for June 8 1867, 181-361

15

The experiments of Mr. Julius Thomsen of Copenhagen have shown that the power required to sustain the burning of one candle is equal to 13 foot pounds. Experiments by Müller Pitchie & myself using arc light of not less than 500 or 1000 candles, power required per candle = 15 foot pounds. By measuring the heating powers of wire in H_2O a Grove battery pint cup size gave 80 foot-pounds per minute.

1° Hpr = 772 foot lbs.

1000 Groves gave 5000 candles

Cost	Sulphuric Acid	$2\frac{1}{2}$	per pound
	Nitric HNO_3	10	" "
	Zn	8	" "
	Hg	50	" "

Total cost about $27.65 per hour

about ~~——~~ $5\frac{1}{2}$ mills per hour per candle

The cost of gas light

$3.25 per 1000 feet

1 cu. ft. gives the light of 3 candles

Cost of gas light per hour about 1 mill per ~~to~~ candle.

With the Siemens battery cost nearly the same as gas.

Cost with Magneto Machines

On a well built machine in 1861 1,100 ft. lbs. required per minute to keep the machine running; But when the circuit was closed 3,200 ft. lbs were required to maintain the same velocity of rotation; nearly all this excess (nearly 2,100 ft. lbs) of power was measured as electricity about 2/3 (say 1,300 ft lbs) being expended internally heating the coils magnets &c. and the balance 800 ft. lbs measured as external useful effect.

Suppose 800 ~~ft lb~~ ft. lbs. useful

$\frac{800}{15} = 53.33$ candles ~~per~~

which could be imported

Taking the total power

$\frac{3200}{53.33} = 60$ ft. lbs required to be given the machine per minute

In the vicinity of Boston power is furnished, at a rate of $150 per year of 313 days

$\frac{150}{313 \times 10} = \$0.0575$ per hour

5¾ cts

If one fourth of power utilized

$\frac{33,000}{4 \times 15} = 550$ candles from one horse power engine

Cost $\frac{0.0575}{550} = \$0.000104.6$

about $\frac{1}{10}$ of a mill per hour = $\frac{1}{10}$ of cost of gas

Average hourly consumption of coal by a good steam engine may be set down as four pounds per hour per horse power.

$= (38{,}000 \times 60) \div 4 = 495{,}000$

foot pounds from one pound of coal. Utilizing as electricity, and thence light, one fourth part of this

$$\frac{495{,}000}{4} = 123{,}750 \text{ ft lbs}$$

or as light

$$\frac{123{,}750}{15 \times 60} = 137.5 \text{ candles burning}$$

for an hour from one lb. of coal, through the agency of the steam engine and the magneto machine.

With thermo electric battery I have been able to develop 130,000 foot lbs. from one lb of coal

$$\frac{130{,}000}{15 \times 60} = 144.4 \text{ candles}$$

Gas

3 hour candle lights per cubic foot

15 hour candle lights per pound of coal used

$$\cancel{\frac{1{,}000{,}000}{200{,}000}} = 5$$

About 25 cubic feet of gas weigh one ~~[illegible]~~ pound. Hence one lb of gas will yield light equal to that from one candle for 75 hours

Theoretically

One pound of pure carbon ~~exactly~~ wholly burned gives 14,500 units of heat or

$$772 \times 14.500 = 11.200.000$$

foot pounds

In candles

$$\frac{11.200.000}{15 \times 365 \times 24 \times 60} = 1\frac{5}{12}$$

or a candle burning for one year and five months

Recapitulation

Gas from one pound of coal give one candle for 15 hours

One pound of gas gives one candle 75 hours

Could all the energy in a pound of coal be converted in light it would give the equivalent of one candle for 12,410

Thus considerably less than the 4 p.c. is obtained in light.